ThuPE18

Self-induced Steady-state Magnetic Field in the Negative Ion Sources with Localized RF Power Deposition

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The study is an extension of a recent activity [1,2] on modelling of the SPIDER source [3] which is under development regarding the neutral beam injection system of ITER. The source is with eight drivers (inductive discharges with cylindrical coils) and a large-area chamber common for all the drivers. In the 2D modelling ([1,2] as well as here) the modelling domain is half of a single driver with the volume from the large-area chamber belonging to it. The previous results [1,2] show that due to a shift in the positions of the maxima of the electron density and temperature, associated with the localization of the rf power deposition outside the region of high electron density, the regime of the discharge is non-ambipolar, with a vortex dc current flowing in a rf discharge. The conclusion drawn is for strong non-locality in the discharge behaviour and, respectively, for strong impact of the fluxes not only of the charged particles but also of the neutral species, including also the energy fluxes. The study of the discharge structure is extended here with accounting for the dc magnetic field self-induced by the dc current. The results are for the modifications, caused the magnetic field, in the discharge behaviour.

References

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